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IN THE CLAIMS

1. (currently amended) A method for enabling the execution of I/O operations by at least a host on at least a production storage element while producing an updated snapshot copy of said production storage element, said method comprises the steps of:

a) on-line performing on-line a write request initiated by said host by writing a new data chunk to a journal and saving a destination address designated in said write request in a changes table, wherein while on-line performing said write request the host is idle;

b) generating a response message ending the execution of said write request and thereby handling enabling said host to execute said I/O operations; and,

c) off-line producing said updated snapshot copy of said production storage element by:

copying a data chunk residing in said production storage element at a location designated by a destination address to a location designated by the destination address in a snapshot storage element; and

copying said new data chunk from said journal to a location designated by said destination address in said production storage element;

wherein while off-line producing said updated snapshot copy said host is released to handle said I/O operations.

2. - 4. (Cancelled)

5. (Original) The method of claim 1, wherein said journal includes at least one non-volatile random access memory (NVRAM) unit.

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6.-8   (Cancelled)

9.   (Currently Amended) The method of claim ~~7~~ 1, wherein off-line producing said updated snapshot copy further comprises the steps of:

a) checking ~~in~~ using said changes table if said data chunk residing in ~~a~~ said snapshot storage element ~~that includes said updated snapshot copy~~ at the destination address was modified since a last time that said updated snapshot copy was updated; and

b) ~~copying said data chunk from a location in said production storage element to said snapshot storage element and further copying said data chunk from said journal to a location in said production storage element, if said data chunk has not been modified; and,~~

~~c)~~ copying said new data chunk from said journal to said production storage element, if said data chunk at the destination address has been modified.

10.   (previously presented) The method of claim 9, wherein said location in said production storage element is determined by said destination address.

11.   (Original) The method of claim 10, wherein said destination address is converted to a physical address if said production storage element is a virtual volume.

12.   (previously presented) The method of claim 1, wherein said I/O operations comprise a read request initiated by the host computer.

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13.   (previously presented) The method of claim 12, wherein executing said read request comprises the steps of:

a) checking if a data chunk requested to be read resides in said journal;

b) retrieving said data chunk from said journal and further sending said data chunk to said host, if said data chunk resides in said journal; and

c) retrieving said data chunk from said production storage element and further sending said data chunk to said host, if said data chunk does not reside in said journal.

14.   (Original) The method of claim 13, wherein checking if said data chunk resides in said journal further comprises the step of:

checking whether the changes table includes an entry associated with said data chunk.

15.   (Cancelled)

16.   (previously presented) The method of claim 15 14, wherein said data chunk is retrieved from a location designated by a source address included in said read request.

17.   (Original) The method of claim 16, wherein said source address is converted to a physical address if said production storage element is a virtual volume.

18.   (Currently Amended) A computer-readable medium having stored thereon computer executable code enabling the execution of I/O operations by at least a host on at least a

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production storage element while producing an updated snapshot copy of said production storage element, said executable code for performing the steps of:

a) on-line performing on line a write request initiated by said host by writing a new data chunk to a journal and saving a destination address designated in said write request in a changes table, wherein while on-line performing said write request the host is idle;

b) generating a response message ending the execution of said write request and thereby handling enabling said host to execute said I/O operations; and

c) off-line producing said updated snapshot copy of said production storage element by:

copying a data chunk residing in said production storage element at a location designated by a destination address to a location designated by the destination address in a snapshot storage element; and

copying said new data chunk from said journal to a location designated by said destination address in said production storage element;

wherein while off-line producing said updated snapshot copy said host is released to handle said I/O operations.

19. - 21.   (Cancelled)

22.   (Original) The computer executable code of claim 18, wherein said journal includes at least one non-volatile random access memory (NVRAM) unit.

23. - 25   (Cancelled)

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26.   (Currently Amended) The computer executable code of claim 24, wherein off-line producing said updated snapshot copy further comprises the steps of:

a) checking ~~in~~-using said changes table if said data chunk resides in ~~a~~-said snapshot storage element ~~that includes said updated snapshot copy~~-at the destination address was modified since a last time that said updated snapshot copy was updated; and

b) ~~copying said data chunk from a location in said the production storage element to said snapshot storage element and further copying said data chunk from said journal to a location in said production storage element, if said data chunk has not been modified; and,~~

~~c)~~ copying said new data chunk from said journal to said production storage element, if said data chunk at the destination address has been modified.

27.   (previously presented) The computer executable code of claim 26, wherein said location in said production storage element is determined by said destination address.

28.   (Original) The computer executable code of claim 27, wherein said destination address is converted to a physical address if said production storage element is a virtual volume.

29.   (previously presented) The computer executable code of claim 18, wherein said I/O operations comprise a read request by the host.

30.   (previously presented) The computer executable code of claim 29, wherein executing said read request further comprises the steps of:

a) checking if a data chunk requested to be read resides in said journal;

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b) retrieving said data chunk from said journal and further sending said data chunk to said host, if said data chunk resides in said journal; and

c) retrieving said data chunk from said storage element and further sending said data chunk to said host, if said data chunk does not reside in said journal.

31.   (Original) The computer executable code of claim 30, wherein checking if said data chunk resides in said journal further includes:

checking whether the changes table includes an entry associated with said data chunk.

32.   (Cancelled)

33.   (previously presented) The computer executable code of claim 31, wherein said data chunk is retrieved from a location designated by a source address included in said read request.

34.   (Original) The computer executable code of claim 33, wherein said source address is converted to a physical address if said production storage element is a virtual volume.

35.   (Currently Amended) An apparatus for execution of I/O operations with by at least a host on at least a production storage element while an producing an updated snapshot copy of said production storage element, said apparatus comprising:

means for receiving a write request operation from said host;

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means for <u>on-line</u> performing ~~on-line~~ said write request by writing a <u>new</u> data chunk to a

journal <u>and saving a destination address designated in said write request in a changes table,</u>

<u>wherein while on-line performing said write request the host is idle;</u>

means for off-line producing said updated snapshot copy of said production storage

element <u>by copying a data chunk residing in said production storage element at a location</u>

<u>designated by a destination address to a location designated by the destination address in a</u>

<u>snapshot storage element;</u>

<u>copying said new data chunk from said journal to a location designated by said</u>

<u>production storage element;</u>

<u>wherein while off-line producing said updated snapshot copy said host is released</u>

<u>to handle said I/O operations;</u>

means for controlling a snapshot storage element;

means for controlling a production storage element; and,

means for controlling a journal.

36.   (Original) The apparatus of claim 35, wherein said snapshot storage element is at

least one of: a virtual volume, a physical storage device;

37.   (Original) The apparatus of claim 35, wherein said production storage element is

at least one of: a virtual volume, a physical storage device.

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38.   (Original) The apparatus of claim 35, wherein said physical storage device
comprises at least one of: tape drive, tape library, optical drive, disk, redundant array of
independent disks (RAID).

39.   (Original) The apparatus of claim 35, wherein said journal includes at least one
non-volatile random access memory (NVRAM) unit.

40.   (previously presented) The apparatus of claim 35, wherein said I/O operations
comprise at least a read request.

41.   (Cancelled)

42.   (Original) The apparatus of claim 35, wherein said apparatus is a storage
controller.

43.   (Original) The apparatus of claim 35, wherein said apparatus is a virtualization
switch connected in a storage area network (SAN).

44.   (Cancelled)

45.   (previously presented) The apparatus of claim 40, wherein executing said read
request comprises the steps of:

    a) checking if a data chunk requested to be read resides in said journal;

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b) retrieving said data chunk from said journal and further sending said data chunk to said host, if said data chunk resides in said journal; and

c) retrieving said data chunk from said storage element and further sending said data chunk to said host, if said data chunk does not reside in said journal.

46. (previously presented) The apparatus of claim 45, wherein checking if said data chunk resides in said journal further comprises:

checking whether a changes table includes an entry associated with said data chunk.

47. - 48. (Cancelled)

49. (Currently Amended) The apparatus of claim u, wherein said performing on-line said further comprises the steps of:

saving a destination address designated in said write request in a changes table; and,

sending a response message ending the execution of said write request to said host.

50. (Currently Amended) The apparatus of claim 49, wherein off-line producing said updated snapshot copy further comprises the steps of:

a) checking in using a said change table if said data chunk resides in the snapshot storage element at the destination address was modified since a last time said updated snapshot copy was updated; and

b) ~~copying said data chunk from a location in said production storage element to said snapshot storage element and further copying said data chunk from said journal to a location in said production storage element, if said data chunk has not been modified; and,~~

~~c)~~ copying said <u>new</u> data chunk from said journal to said production storage element, if said data chunk <u>at the destination address</u> has been modified.

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